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(54) Title: TAPE COMPOSITION UTILIZING A MULTI-LAYER FILM

(57) Abstract

A tape composition is disclosed which utilizes a multi-layer co-extruded film having a first layer comprising a film having a low energy surface, and a second layer having high tensile strength, flexibility and a low rate of water vapor transmission. The multi-layer film is laminated with a fabric layer which imparts straight line tearing characteristics to the tape and an adhesive to form the finished product.

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TAPE COMPOSITION UTILIZING A MULTI-LAYER FILM

Background of the Invention

It has long been known to manufacture and distribute cloth or woven duct tape for various uses. The top surface of cloth duct tape as commonly used is pigmented low or medium density polyethylene. The polyethylene is applied to the tape's reinforcing scrim either through direct coating or through adhesive lamination of a preformed film. The tape is normally found in prewound roll form in which the adhesive upper layer is in direct contact with the polyethylene surface of the lower layer without an intervening abhesive layer. The low surface energy of the polyethylene allows the tape to be unwound for use without the undue application of force which would cause the tape to delaminate or tear.

Cloth duct tapes often contain pigments to impart color to the tape. As the pigment level in the polyethylene layer is increased, however, the resistance to unwind also increases. At critical pigment loadings, the tape cannot be used or processed due to the difficulty in unwinding. This problem means that lower pigment levels must be used, which requires, in some instances, higher cost pigments to achieve the desired effect.

A tape product which can tolerate high pigment levels without adversely affecting the unwind characteristics of the tape, and which has other desirable performance characteristics is needed.

Summary of the Invention

The present invention relates to a tape composition which comprises a multi-layer film, a fabric and an adhesive layer. The multi-layer film comprises a first top layer comprising a polymeric film having a low energy surface. The top layer is preferably translucent. The film further contains a second or bottom layer comprising a polymeric film which is characterized by high flexural strength, resistance to penetration by water or moisture, and/or a high heat deflection temperature. The multi-layer film optionally can contain additional layers disposed between the top and bottom layers as desired or needed. The film can contain as many layers as necessary to provide the desired performance characteristics.

The second or bottom layer and/or the intermediate layers preferably contain a pigment. The use of the multi-layer film allows higher pigment loadings and/or lower grade pigments to be used. Since the top translucent layer overlays the pigmented layer, the amount and/or type of the pigments used does not affect the roll unwind characteristics of the finished tape.

A reinforcing fabric is located adjacent the bottom layer of the film. The fabric may be attached to the bottom film layer with an adhesive, or may be embedded in the adhesive layer. The fabric is generally a thin layer of woven or knitted fabric or other material. The fabric can be for example, a woven cotton and/or polyester fabric, or a cotton/polyester fabric woven from blended yarns. The fabric preferably is characterized by a weave which allows the fabric to be torn preferentially in a straight line across the width of the tape. The fabric thus provides cross-directional tearing strength and tensile strength to the tape.

The tape further contains a base adhesive layer. Adhesives which can be used for the base adhesive layer are pressure sensitive adhesives. The adhesive is selected to adhere tightly to the bottom film layer and/or to the fabric, but can be easily separated from the top layer of the film when the roll is unwound. Resin tackified rubber-based adhesives are particularly useful for making the present tape.

Methods for making the present tape composition are also the subject of the present invention. In general, the multi-layer film is formed by coextruding at least two polymer resins which form a multi-layered film having the desired properties. The multi-layer film is then combined with the fabric and the base adhesive layer to form the finished product. In one embodiment of the present method, fabric having an open weave is used, which permits the base adhesive to penetrate through the fabric. In this embodiment, the fabric is positioned adjacent the bottom layer of the multi-layer film, and the adhesive is coated onto the fabric layer. The adhesive penetrates the voids between the threads of the fabric and attaches to the bottom layer of the film, thereby forming an adhesive bond with the film and embedding the fabric layer in the adhesive. In another embodiment, a closely woven fabric is used which contains very small voids and therefore does not permit the base adhesive to penetrate. In this case, the fabric is attached to the bottom layer of the film by coating the film or the fabric with an adhesive and contacting the film with the fabric under conditions sufficient to form a adhesive bond between the film and the fabric. Corona treatment of the bottom side of the film that is attached to the fabric is commonly used to improve the film to adhesive bond. The base adhesive is then coated onto the exposed side of the fabric forming the finished tape.

The tape composition of the invention has superior unwind properties, particularly at high unwind speeds. The present invention includes a method for reducing the unwind resistance of a tape, particularly at high speeds. It has been found that the present tapes utilizing a multi-layer film of the above composition exhibit significantly reduced unwind resistance at processing speeds, which are generally from about 300 to about 650 feet per minute. The lower unwind resistance at these speeds allows faster and more efficient manufacturing processes to be used. The tape retains sufficient unwind resistance at low speeds however, to maintain the integrity of the tape roll.

Brief Description of the Drawings

Figure 1 is a schematic illustration showing a cross-sectional view of the tape of the present invention having a multi-layered film.

Figure 2 is a schematic illustrating showing a cross-sectional view of the tape of the present invention having a bi-layered film and an adhesive layer between the fabric and the film.

Detailed Description of the Invention

The tape of the present invention comprises a multi-layer film, a fabric and a base adhesive layer. There may be an additional adhesive layer between the bottom film layer and the fabric for bonding the fabric to the film, if desired or needed. The structures of two different embodiments of the tape are shown schematically in the Figures.

Referring to the Figures, Figure 1 shows a cross-sectional view of one aspect of the present tape. In this embodiment, tape 10 comprises a multi-layered film, represented by layers 12, 20 and 14, a fabric 16 and an adhesive 18. The multi-layer film is a coextruded film comprising a first top layer 12 comprising a polymeric material which forms a film having a low energy surface. The top layer 12 is preferably transparent or translucent. Polymeric materials appropriate for use in the top layer 12 include thermoplastic polymers, copolymers or polymer blends which form a film having a low surface energy. A film having a surface energy of less than 30 dynes/cm is preferred. The surface energy must be sufficiently low to allow the tape roll to be unwound for use without undue stress which can cause delamination of the adhesive or film layers. Polymers or copolymers which satisfy this criteria include, for example, low density polyethylene, medium density polyethylene, fluorocarbon polymers or copolymers, and silicone polymers or copolymers. Low or medium density polyethylene is preferred for this purpose.

Low density polyethylene (LDPE) is particularly preferred due to its [Availability and cost. LDPE is a branched form of polyethylene having a density of from about 0.910 to about 0.940 grams per cubic centimeter (g/cc). Medium density polyethylene (MDPE) refers to

polyethylene polymers having a density of about 0.940 g/cc.

The film has a second or bottom layer 14 comprising a polymeric material which exhibits high flexural strength or stiffness, a high heat deflection temperature and has a low rate of water vapor transmission. A polymer having heat deflection temperature of at least 120°F, and preferably at least 140°, and a water vapor transmission rate of less than about 1.25, and preferably less than 1.0, gm/mil/100in/24 hours is preferred. A polymer having a flexural modulus of at least 140 x 10^3 psi is preferred. The bottom layer 14 can comprise thermoplastic polymers, copolymers or polymer blends which form films which exhibit at least one and preferably all of the above characteristics. The second layer also can provide improved tape appearance by bridging the gaps in the woven fabric, if it exhibits high stiffness. Polymers or copolymers which satisfy these criteria include high density polyethylene (HDPE) and polystyrene blends.

HDPE is particularly preferred for this purpose. HDPE is linear polyethylene, or polyethylene having a very low degree of branching, with a density of from about 0.940 g/cc to about 0.970 g/cc or higher.

One or more desired characteristics can be imparted to the film by including additional intermediate layers in the film. For example, if the bottom layer 14 has high flexural strength but lacks heat deflection properties, one or more additional layers comprising a polymer film having such properties can be coextruded with the first and second layers resulting in a multi-layer film having all of the desired characteristics. This optional layer (or layers) can be positioned between the first and second layers, or

after bottom layer 14, and is represented by numeral 20 in Figure 1. The film can contain as many intermediate layers as necessary to obtain the properties desired. The multi-layer film has a total thickness of about 1.0 to 2.0 mils. The clear top layer is preferably about 0.3 mils and the pigmented bottom layer or layers can be up to about 1.7 mils thick.

The multi-layer film preferably contains one or more pigments to impart color to the tape. Color is imparted to the tape by dispersing a pigment or pigment blend of the appropriate color in the polymer resin which forms the tape backing. However, the addition of pigment to the resin increases the surface energy of the film which forms from the resin. This higher surface energy results in an increase in the resistance of the tape to unwinding. To counter this effect, tape manufacturers have had to use less pigment, which mean that more expensive pigments often must be used to achieve the desired color. In the present tape composition the pigments are contained in the bottom and/or intermediate layers, and the top, low surface energy layer which overlays it is translucent or transparent. Thus, higher pigment loading and less expensive pigments can be used in the tape without negatively affecting roll unwind and other properties of the tape.

The fabric 16 can be any woven or knitted fabric including, for example, woven cotton or polyester fabric or cotton/polyester fabric woven from blended yarns. Stitch bonded materials having about 22 to 24 strands per inch can also be used. The fabric 16 is selected so that it resists tearing or splitting along its longitudinal axis and tears in a straight line across its transverse axis. This allows a portion of the tape to be neatly torn off for use without the

necessity for cutting the tape. Materials which are particularly useful as fabric in the present composition include cotton, cotton/polyester or 100% polyester fabrics having a thread count of preferably from about 10 to about 60 threads per inch, in which the weave or other structure is selected in a manner known per se to permit cross-directional tearing.

The adhesive 18 can be any pressure sensitive adhesive. The adhesive 18 is selected so that it forms a tight adhesive bond with the fabric and with the bottom layer of the film. Pressure sensitive adhesives which are useful in the present invention include, for example, polyacrylates, such as poly(ethylhexyl acrylate), and resin tackified rubber based adhesives. Resin tackified rubber based pressure sensitive adhesives are particularly preferred.

The film layer used for the face portion of the tape is prepared by coextruding polymer resins to form a multi-layered film. Methods of coextrusion are well known in the art. In general, films or sheets consisting of two or more different polymers are produced by mixing molten streams of the polymer resins from a like number of extruders into a multi-manifold die. Coextrusion is used to combine materials to provide combinations of properties that cannot be obtained in a single polymer. the coextruded layers are permanently combined with each other to form a unitary coextrudate.

The fabric and the base adhesive layer are then applied to the coextruded film. If a closely woven fabric is used, the fabric can be attached to the bottom layer of the film with adhesive. The adhesive can be applied by any known technique for applying films.

A preferred method of making the present tape is by calendering. Calendering is a process used for the continuous manufacture of coated webs. The pressure sensitive adhesive is passed between pairs of highly polished, temperature-controlled rolls under high pressure. The spacing between the calender rolls ensures that an even layer of adhesive of a desired thickness is coated. In this method, if a closely woven fabric is used, the fabric is coated on both sides with adhesive in the calendering operation and one side is laminated to the bottom of the multilayer film with this same adhesive coating. If the fabric has a sufficiently open weave, both the fabric and the film are passed through the calender together with the fabric in contact with the bottom of the multilayer film. The adhesive is pressed through the voids of the fabric during the calendering operation and bonds to the film, and the fabric becomes embedded in the adhesive layer.

In a preferred embodiment of the present invention, a tape product was manufactured utilizing a 1.8 mil 2-layer coextruded film for the tape backing. The top layer was non-pigmented low density polyethylene and the bottom layer was pigmented high density polyethylene. A tape utilizing a single layer 2.25 mil film of pigmented low-density polyethylene was processed in the identical manner for comparison. Both films were extruded and combined with a fabric and adhesive to form the finished product. The fabric and adhesive were applied to the film using a 3-roll calender. The fabric was a woven cotton/polyester fabric and the adhesive was a resin tackified rubber-based adhesive.

The tape made from the thinner multi-layered film had the better appearance and was easier to process due

to its easier high-speed roll unwind character. The multi-layer tape composition exhibits reduced unwind resistance at high speeds which allows manufacturing operations for making the rolls of tape to proceed faster and more efficiently. For example, cloth tapes are generally manufactured in large rolls, which can be, for example, 50 inches wide and wider. The large rolls are "slit" into smaller rolls (usually 2 inches wide) for use by the consumer.

The unwind resistance of an "as calendered" full width, supply roll of tape can vary from negligible to so high that the backing tears on unwind. To form commercially useful rolls of tape, the full width supply roll is converted to smaller rolls by unwinding it, sending it through a slitter that cuts it into shorter, narrower widths for end use or sale and rewinds it. If the unwind resistance is too low, the tape unwinds easily in the manufacturing plant, but its adhesion to its backing is too low to form a coherent roll which is necessary to be of practical use. If the unwind resistance is too high, the tape will adhere well in the end use application, but is difficult to unwind in the plant for slitting. If the unwind resistance is too high, the mechanisms on the slitting machines which unwind the tape are greatly stressed and burn out. Plant slitting speeds can vary from a normal running speed of about 300 ft./min. for a manual slitter to a normal running speed of about 650 ft/min. or more for an automated slitter.

Tapes of the present invention avoid these problems by providing a product having low unwind resistance at high speeds such as those used in the slitting operation, e.g., greater than 300 ft/min., but has higher unwind resistance at low speeds, such as those a user would employ. Thus, the present tape composition provides a unique combination of properties.

In an example illustrating the high speed properties of the present tape, tapes using the same type of adhesive and fabric but two different films, were compared. Tape #1 contained the standard low density polyethylene 3 mils thick with 0.5% of aluminum pigment; and tape #2 contained coextruded 1.8 mil thick LD/HD polyethylene film with no pigment in the top LD polyethylene layer. Both tapes were made by the calendaring method described above.

The adhesion to the backing, which is indicative of the low speed unwind characteristics, and the high speed unwind resistance of the two tapes were compared. The results are shown in the Table:

	Film #1	Film #2
Adhesion to backing (oz./in.) +	29.3	31.2
Unwind resistance (#/in.) ++	4.5	3.7

+ Pressure Sensitive Tape Council Test Method PSTC-1

++ 600 ft./min. unwind speed

The above data in the Table show that the tape containing the standard pigmented LD polyethylene (Film #1) had a slightly lower adhesion to backing when compared to the tape utilizing the coextruded polyethylene, but that its unwind resistance at 600 ft./min. was more than 21% higher. These results indicate that the high speed unwind resistance of the tape tends to be lower as the pigment in the release surface of the film is reduced, without adversely

affecting the adhesion to backing characteristic required for product use.

The tapes of the present composition and method are strong, flexible and moisture proof, and provide an improved appearance compared to previously available tapes of the same type made with a single face layer. The present tapes achieve superior appearance and performance with a higher film pigment level, a stiffer film and/or a more heat resistant film. Since lower grade pigments and thinner film gauges can be used, the raw material costs for producing the tape are reduced. The present tapes exhibit improved roll unwind properties which results in a higher grade product and lower processing costs.

Equivalents

One skilled in the art will be a able to ascertain many equivalents to the specific embodiments described herein. Such equivalents are intended to be encompassed by the scope of the following claims.

CLAIMS

1. A tape composition comprising:
   a. a multi-layer film comprising a top layer comprising a polymer or copolymer film having a low energy surface for unwind release and a bottom layer comprising a flexible polymer or copolymer film having a high heat deflection temperature and a low water vapor transmission rate;
   b. a fabric adjacent the bottom layer; and
   c. a pressure-sensitive adhesive layer.

2. The composition of Claim 1 wherein the top layer comprises a polymer selected from the group consisting of: low density polyetheylene, medium density polyethylene, fluorocarbon polymers, fluorocarbon copolymers, silicone polymers and silicone copolymers.

3. The composition of Claim 1 wherein the bottom layer comprises a polymer selected from the group consisting of high density polyethylene polymers, polystyrene polymers, high density polyethylene-polystyrene copolymers and high density polyethylene-polystyrene blends.

4. The composition of Claim 1 wherein the fabric is selected from the group consisting of: cotton, polyester and cotton-polyester blends.

5. The composition of Claim 1 wherein the adhesive is a resin tackified rubber-based adhesive.

6. The composition of Claim 1 wherein the fabric is bonded to the bottom layer with a second adhesive.

7. The composition of Claim 1 wherein the adhesive is bonded to the second layer and the fabric is integrally incorporated into the adhesive layer.

8. The composition of Claim 1 wherein the bottom layer contains a pigment.

9. The composition of Claim 1 further comprising at least one intermediate film layer comprising a thermoplastic polymer, copolymer or polymer blend which is disposed between the top and bottom layers of the film.

10. A tape composition comprising:

a. a multi-layer film comprising a top layer comprising translucent low density polyethylene and a bottom layer comprising pigmented high density polyethylene;
b. a fabric adjacent the bottom layer; and
c. a pressure-sensitive adhesive layer.

11. The tape composition of Claim 10 wherein the fabric is a woven or non-woven fabric selected from the group consisting of: cotton, polyester, and cotton-polyester blends.

12. The tape composition of Claim 10 wherein the adhesive comprises a resin tackified rubber-based adhesive.

13. The tape composition of Claim 10 wherein the fabric is bonded to the bottom layer with a second adhesive.

14. The tape composition of Claim 10 further comprising at least one intermediate film layer comprising a thermoplastic polymer, copolymer or polymer blend which is disposed between the top and bottom layers of the film.

15. A method for reducing the high speed unwind resistance in a tape composition comprising a backing, a fabric and an adhesive, the method comprising utilizing a multilayered coextruded film backing in the tape, said film comprising a top layer of a polymer or copolymer film having a low surface energy and a bottom layer of a flexible polymer or copolymer film having a high heat deflection temperature and a low water vapor transmission rate.

16. The method of Claim 15 wherein the top layer comprises a polymer selected from the group consisting of: low density polyethylene, medium density polyethylene, fluorocarbon polymers, fluorocarbon copolymers, silicone polymers and silicone copolymers.

17. The method of Claim 16 wherein the top layer comprises low density polyethylene.

18. The method of Claim 16 wherein the bottom layer comprises a polymer selected from the group consisting of: high density polyethylene, polystyrene polymers, high density polyethylene-polystyrene copolymers and high density polyethylene-polystyrene blends.

19. The method of Claim 18 wherein the bottom layer comprises high density polyethylene.

20. The method of Claim 19 wherein the bottom layer contains a pigment.

AMENDED CLAIMS

[received by the International Bureau on 15 March 1993 (15.03.93); original claims 1,2,4,7,15,16 and 18 amended; new claims 21 and 22 added; remaining claims unchanged (4 pages)]

1. A tape composition comprising:

a. a coextruded multi-layer film comprising a top layer comprising a non-pigmented transparent or translucent polymer or copolymer film having a surface energy of less than about 30 dynes/cm and a pigmented bottom layer comprising a flexible polymer or copolymer film having a flexural modulus of at least about 140 x 10^3 psi, a heat deflection temperature of at least about 120°F and a water vapor transmission rate less than about 1.25 gm/mil/100in/24 hours;

b. a fabric adjacent the bottom layer; and

c. a pressure-sensitive first adhesive layer;

wherein said tape composition can be unwound at speeds above about 300 ft/min; and

wherein said multi-layer film has a total thickness of about 1.0-2.0 mils.

2. The composition of Claim 1 wherein the top layer comprises a polymer selected from the group consisting of low density polyethylene, medium density polyethylene, fluorocarbon polymers, fluorocarbon copolymers, silicone polymers and silicone copolymers.

3. The composition of Claim 1 wherein the bottom layer comprises a polymer selected from the group consisting of high density polyethylene polymers, polystyrene polymers, high density polyethylene-polystyrene copolymers and high density polyethylene-polystyrene blends.

4. The composition of Claim 1 wherein the fabric is selected from the group consisting of cotton, polyester and cotton-polyester blends.

5. The composition of Claim 1 wherein the adhesive is a resin tackified rubber-based adhesive.

6. The composition of Claim 1 wherein the fabric is bonded to the bottom layer with a second adhesive.

7. The composition of Claim 1 wherein the adhesive is bonded to the bottom layer and the fabric is embedded in the adhesive layer.

8. The composition of Claim 1 wherein the bottom layer contains a pigment.

9. The composition of claim 1 further comprising at least one intermediate film layer comprising a thermoplastic polymer, copolymer or polymer blend which is disposed between the top and bottom layers of the film.

10. A tape composition comprising:

a. a multi-layer film comprising a top layer comprising translucent low density polyethylene and a bottom layer comprising pigmented high density polyethylene;

b. a fabric adjacent the bottom layer; and

c. a pressure-sensitive adhesive layer.

11. The tape composition of Claim 10 wherein the fabric is a woven or non-woven fabric selected from the group consisting of: cotton, polyester, and cotton-polyester blends.

12. The tape composition of Claim 10 wherein the adhesive comprises a resin tackified rubber-based adhesive.

13. The tape composition of Claim 10 wherein the fabric is bonded to the bottom layer with a second adhesive.

14. The tape composition of Claim 10 further comprising at least one intermediate film layer comprising a thermoplastic polymer, copolymer or polymer blend which is disposed between the top and bottom layers of the film.

15. A method for reducing the high speed resistance to unwinding in a tape composition comprising a backing, a fabric adjacent said backing, and an adhesive layer adjacent said fabric or adhered to said backing and having the fabric embedded therein, the method comprising providing a multilayered coextruded film backing in the tape, said film comprising a top layer of a non-pigmented transparent or translucent polymer or copolymer film having a surface energy of less than about 30 dynes/cm and a pigmented bottom layer of a flexible polymer or copolymer film having a flexural modulus of at least about 140 x 10^3 psi, a heat deflection temperature of at least about 120°F and a water vapor transmission rate less than about 1.25 gm/mil/100in/24 hours;

wherein said tape composition can be unwound at speeds above about 300 ft/min; and

wherein said multi-layer film has a total thickness of about 1.0 to 2.0 mils.

16. The method of Claim 15 wherein the top layer comprises a polymer selected from the group consisting of low density polyethylene, medium density polyethylene, fluorocarbon polymers, fluorocarbon copolymers, silicone polymers and silicone copolymers.

17. The method of Claim 16 wherein the top layer comprises low density polyethylene.

18. The method of Claim 16 wherein the bottom layer comprises a polymer selected from the group consisting of high density polyethylene, polystyrene polymers, high density polyethylene-polystyrene copolymers and high density polyethylene-polystyrene blends.

19. The method of Claim 18 wherein the bottom layer comprises high density polyethylene.

20. The method of Claim 19 wherein the bottom layer contains a pigment.

21. The composition of claim 2, wherein the top layer comprises low density polyethylene.

22. The composition of claim 3, wherein the bottom layer comprises high density polyethylene.

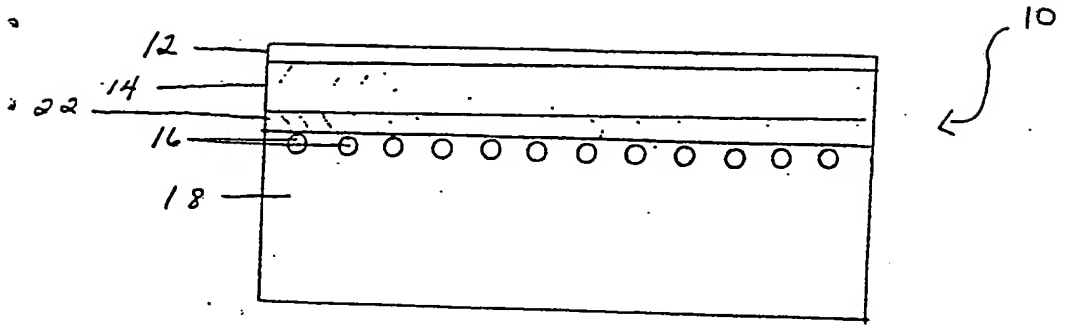

FIG. 2

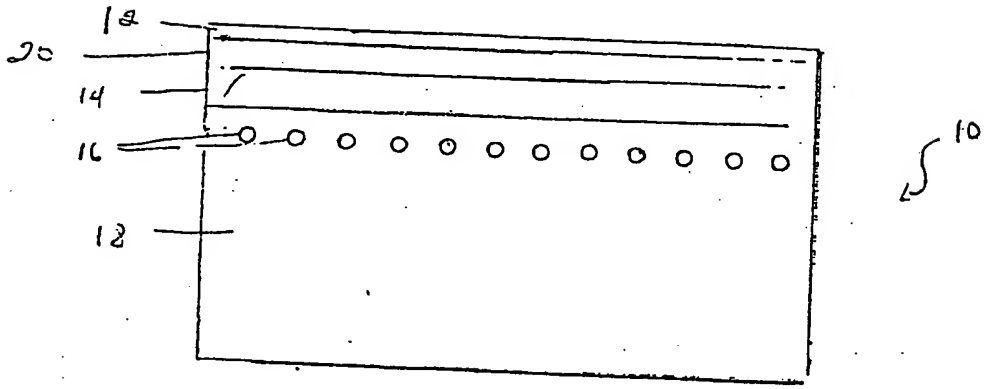

FIG. 1

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 92/07736

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 C09J7/02; B32B27/12

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	C09J ; B32B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category[*]	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	EP,A,0 389 212 (THE KENDALL COMPANY) 26 September 1990 see claims see page 2, line 37 - page 3, line 14 see page 3, line 38 - line 40 see examples 1,3 ---	1,2,4,8
X	EP,A,0 301 764 (THE KENDALL COMPANY) 1 February 1989 see claims see column 3, line 34 - column 4, line 31 see column 5, line 22 - line 36 see example 1 --- -/--	1,2,4,8

[*] Special categories of cited documents :[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
15 JANUARY 1993	28. 01. 93
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	HOLLENDER C.J.F

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category*	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
X	US,A,4 636 427 (OHNO ET AL.) 13 January 1987 see claims 1,7,9-11 see column 2, line 59 - line 68 see column 4, line 37 - line 44 see figure 3	1-3,8
A	US,A,4 188 442 (ASAKURA ET AL.) 12 February 1980 see claims 1,3-5 see column 2, line 42 - line 47 see column 3, line 43 - column 4, line 10 see column 4, line 52 - line 60 see figure 2	1-3,6, 8-10, 13-20
A	US,A,4 303 724 (SERGEANT ET AL.) 1 December 1981 see claims 1-6 see column 2, line 26 - line 36 see column 3, line 24 - column 4, line 22 see figures 6-8	1,2,4,5, 7
A	EP,A,0 096 841 (MANULI AUTOADESIVI SPA) 28 December 1983 see the whole document	15

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

US 9207736
SA 65185

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0389212	26-09-90	AU-B-	625423	09-07-92
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		CA-A-	2012540	20-09-90
		JP-A-	3041180	21-02-91
EP-A-0301764	01-02-89	AU-B-	606179	31-01-91
		AU-A-	1907088	02-02-89
		JP-A-	1087682	31-03-89
US-A-4636427	13-01-87	JP-B-	1041189	04-09-89
		JP-C-	1614728	15-08-91
		JP-A-	61118483	05-06-86
US-A-4188442	12-02-80	JP-A-	53134838	24-11-78
		JP-A-	53081543	19-07-78
		US-A-	4173676	06-11-79
		US-A-	4188439	12-02-80
US-A-4303724	01-12-81	AU-B-	543408	18-04-85
		AU-A-	7492081	11-03-82
		BE-A-	890236	04-01-82
		CA-A-	1145624	03-05-83
		DE-A,C	3134712	29-04-82
		FR-A,B	2489353	05-03-82
		GB-A,B	2082969	17-03-82
		JP-C-	1616148	30-08-91
		JP-B-	2039549	06-09-90
		JP-A-	57076075	12-05-82
		NL-A-	8104089	01-04-82
		SE-B-	453995	21-03-88
		SE-A-	8105239	05-03-82
EP-A-0096841	28-12-83	AU-A-	1571483	15-12-83
		CA-A-	1223777	07-07-87
		JP-A-	59004669	11-01-84
		US-A-	4594277	10-06-86

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